



EUROPEAN UNIVERSITY INSTITUTE
DEPARTMENT OF ECONOMICS

EUI Working Paper **ECO** No. 2004 /23

Temporary Workers:
How Temporary Are They?

TOMMASO NANNICINI

BADIA FIESOLANA, SAN DOMENICO (FI)

All rights reserved.
No part of this paper may be reproduced in any form
Without permission of the author(s).

©2004 Tommaso Nannicini
Published in Italy in August 2004
European University Institute
Badia Fiesolana
I-50016 San Domenico (FI)
Italy

Temporary Workers: How Temporary Are They?

Tommaso Nannicini*
European University Institute

First version, May 2002
This version, April 2004

Abstract

This paper studies the effect of production volatility on the duration of temporary contracts. A simple theoretical model is developed, in order to depict the choice of contract duration made by a firm recruiting temps to deal with activity peaks. Assuming that the hiring of a new temp is associated with selection and training costs, longer contracts have an option value in view of greater uncertainty. The model has two testable implications. First, production volatility positively affects contract length. Second, the shortage of alternative employment opportunities negatively affects contract length. Using data on Italian temporary workers, both implications are confirmed by the econometric analysis. Since contract duration turns out to be a good proxy of the precariousness of temps, it is precisely in more volatile sectors that temporary workers -in a sense- are not so “temporary”.

*I would like to thank “Manpower Italia” for allowing me to use its personnel data set. Many thanks also to Andrea Ichino, Samuel Bentolila, participants at the XVII AIEL Conference in Labor Economics, and lunch seminar participants at EUI and MIT for their insightful comments and suggestions. *Contact information:* EUI, Department of Economics, Via della Piazzuola 43, 50133 Firenze, ITALY. Email: tommaso.nannicini@iue.it.

1 Introduction

During the 1990s, temporary help employment (THE henceforth)¹ widely expanded in developed countries. It rapidly grew where it was already used and was liberalized where it was previously forbidden. Even though it maintains a small absolute incidence over the stock of total employees at any point in time, this non-standard contract is now a common experience of a large number of individuals, because of the high turnover of workers employed in similar positions. Many issues concerning THE have been analyzed in theoretical and empirical works: the reasons why it is used; the factors explaining its recent growth in different environments; the characteristics of workers who select themselves into this relationship; the transition from temporary to permanent employment.² One issue that has remained unexplored concerns the determinants of contract length in this employment relationship. Segal and Sullivan (1997a) use US administrative data to study the duration of job spells in the THE industry, but they do not investigate what affects the length of the assignments. This paper focuses on the determinants of desired contract durations, and particularly on the relationship between production volatility and contract length. Focusing on this issue is interesting *per se*, since it offers an empirical test which discriminates between the diverging findings of the theoretical literature on contract length (briefly reviewed in Section 2). Moreover, this analysis sheds light on the welfare effects of THE, since contract duration turns out to be a good proxy of “how temporary” temporary workers actually are (as discussed below).

The Italian labor market is the reference case, but the results might have a general scope. In Italy, THE was recently liberalized (see law 196/1997)³ and

¹This expression refers to a triangular contract, in which an agency hires a worker for the purpose of placing her/him at the disposal of an using firm for a short-term assignment.

²See -among others- Segal and Sullivan (1997a, 1997b), Abraham (1988), Estevao and Lach (1999), Houseman (2000) and Autor (2000a, 2000b) about the US; Russo *et al.* (1997), Lechner *et al.* (2001), Malo and Munoz-Bullon (2002), Montanino and Sestito (2003) and Ichino *et al.* (2004) about European countries. See Oecd (2002) for a survey.

³The Italian law forbids firms to use temporary contracts in the following cases: replacement of workers on strike; firms that made collective dismissals in the last 12 months; jobs that require medical vigilance; firms that are experiencing a time-of-work reduction. Collective agreements stipulate that temporary workers cannot exceed 8-15% of total employees (depending on the sector), and fix the allowed motivations for using them (peak activity; one-off work; expertise not available within the firm). Firms cannot extend an individual contract for a cumulated period longer than 24 months.

firms have started using temporary workers (temps henceforth) extensively, especially in the manufacturing sector. The liberalization of THE immediately triggered a stormy policy debate over the risk of establishing a “dual labor market”. In a dual labor market, *regular* jobs (with long-term contracts, higher wages and union protection) coexist with *precarious* jobs (with short-term contracts, lower wages and no access to benefits tied to length of service). This phenomenon can arise from different dynamics: efficiency-wage arguments, which lead firms to grant security to primary employees and use secondary workers to deal with fluctuations in demand (Saint-Paul, 1996); diverging paths of regulation for standard and non-standard contracts; flux and uncertainty, which adhere in the economic system and unevenly influence factors of production or different groups of workers (Piore, 1980). If the liberalization of THE reinforced a similar phenomenon in Italy, one should observe that temps are primarily used in more volatile sectors and they are more precarious (i.e. receive shorter assignments and experience a lower probability to find a permanent job) exactly in those sectors.

In a related paper (Nannicini, 2004), I estimate the average utilization of THE by economic sector and find that the utilization rate is positively correlated with production volatility. It may still be the case, however, that in more volatile sectors temporary workers receive longer assignments or end up attaining a stable job with greater probability. This is the reason why the following analysis tries to disentangle the effect of production volatility on the duration of temporary contracts. Contract duration, indeed, seems a good proxy of the precariousness of temps. According to the finding by Montanino and Sestito (2003) -about THE in Italy- contract length is positively correlated with the probability to get a stable job.⁴ A three-month increase of contract duration (equal to the standard deviation in their sample) enhances the probability to get a permanent job by 8 percentage points (the average probability being equal to 34%). This positive association may be due to the screening function of THE, or to the fact that workers with longer assignments have a greater probability to be employed in the firm when a permanent vacancy arises. Moreover, for temps who do not achieve a permanent position and go through repeated assignments, the average length of

⁴More precisely, Montanino and Sestito (2003) find a reverse U-shaped relationship: contract duration firstly enhances and then decreases the probability to find a stable job. However, the peak of this relationship is equal to 274 days (against an average duration of 73 days). In the sample used here, only 5% of total observations show a longer duration. Hence, the effect of contract length can be considered as positive.

future contracts is highly correlated with the length of the first one (with a coefficient of correlation equal to 0.7 in the sample used here).

The structure of the paper is as follows. In Section 2, the conflicting findings of the theoretical literature on labor contract length are briefly reviewed. Section 3 presents a rudimentary theoretical model, which captures the relevant trade-off in the firm's choice of THE contract length. Section 4 tests the main predictions of the model. The econometric analysis makes use of the Italian data set of "Manpower", one of the main agencies in the recently born Italian market. Section 5 draws some conclusions.

2 Theoretical Literature on Contract Length

There is a rich theoretical literature on the determinants of desired contract durations, leading to conflicting predictions about the impact of uncertainty and volatility on contract length. The early contributions emphasize that volatility is negatively related to contract length, whereas contracting costs positively affect duration. Gray (1978) concludes that "increased variability -regardless of source- shortens contract length". Similarly, the effect of increased contracting costs on contract length is positive. These implications arise from two basic ingredients: a *transaction-cost* argument and an *efficient-production* argument. The former emphasizes that longer contracts lower the losses due to transaction costs. The latter stresses that shorter contracts reduce the expected losses due to inefficient production and employment. This is true because these expected losses increase with the deviation of the actual real wage from the real wage that would equate the demand and supply of labor, and such a deviation is greater for more distant periods as uncertainty rises over time. Dye (1985) builds a model which tries to overcome some of the limitations of Gray's approach, finding the same theoretical implications about uncertainty and contracting costs.

More recent models, however, stress that volatility may have a positive effect on contract length under some circumstances. Harris and Holmstrom (1987) find such a result using an *information-cost* argument. They develop a model where recontracting occurs when the parties find it profitable to update their information and pay the associated cost. In this setting, contract length is the period between costly observations of the underlying state process. Contracts may increase their duration with a greater uncertainty since, with a noisier process, costly information is less valuable. More precisely, Harris

and Holmstrom's analysis leads to a U-shaped effect of the variability of the state process on contract duration: when the process is less volatile, contract length decreases with noisiness; on the contrary, when the process is more volatile, contract length increases with noisiness. Danziger (1988) uses an *efficient-risk-sharing* argument while showing a positive association between uncertainty and contract duration. A long-term labor relationship can provide insurance against aggregate negative shocks for risk-averse workers. The larger the aggregate variability, the greater the value attached to the insurance protection delivered by longer contracts.

Empirical studies on the relationship between volatility and labor contract length find mixed results (Vroman, 1989; Wallace and Blanco, 1991; Murphy, 1992), failing to establish any consistent evidence about the role of uncertainty in shaping contract durations. The econometric analysis performed in Section 4, which tries to disentangle the effect of volatility on THE contract length, can be seen as a peculiar test discriminating between the conflicting predictions of the literature reviewed above. It should be noted, however, that the assumptions of all these theoretical models fit well with the bargaining process of standard employment (where contracts are signed in a regular and unionized setting), while THE assignments respond to different motivations and incentives. In the next section, a very simple model of the choice of THE contract length is developed. As illustrated below, this model leads to the same conclusion as Harris and Holmstrom's or Danziger's (i.e. a positive association between volatility and duration), because of an *option-value* argument: if the hiring of a new temp is related to an initial cost due to selection or training, longer contracts have an option value in the face of greater variability.

3 A Simple Model

The following model is an attempt to depict the choice of THE contract length made by a firm which wants to hire a temporary worker in order to face a non-permanent increase in market demand. This does not mean that flexibility is the only rationale for hiring contingent employees. However, according to surveys among firms, this is the most important motivation. When asked why they make use of temporary workers, firms usually give two types of answer: (1) organizational or business-cycle flexibility; (2) screening

or personnel selection.⁵ The peak-in-demand rationale is always the most often cited reason and deserves particular attention when addressing the issue of contract length, which is a decision strictly linked to the original motivation of the contract. Incidentally, it should be noticed that flexibility and screening are not necessarily *substitute* motivations, since in many cases they may *complement* each other. For example, a firm might hire a temp to face a positive shock and decide later to use the same worker (already screened during the short-term assignment) to fill a permanent vacancy.

The model below describes the choice of a firm which makes use of temps in order to adjust its labor force to fluctuations in demand. In this secondary sector of the labor market, the firm is assumed to have all bargaining power, i.e. it can determine both contract duration and wage. The trade-off arising in the firm's choice of contract length consists of the following. On one hand, an increase of contract duration produces an expected gain: it allows the firm to sidestep the investment in specific training, needed to insert a new temp in the production process, if the positive shock is still there in the immediate future and the old worker is no longer available (*option value* of contract length). On the other hand, an increase of contract duration is clearly associated with an expected loss: it forces the firm to pay the temp even when she/he is no longer useful, if the positive shock disappears. What follows is a simple formalization of such a trade-off.

Assume that the market demand a firm is facing evolves according to the stochastic process D_t in discrete time. Demand can take three values: high (D_H); normal (D_N); low (D_L). For the firm, it makes sense to hire temporary workers⁶ only when demand is high. The temp's productivity is equal to θ in such a case and zero otherwise. The firm's decision problem

⁵Bronstein (1991), reviewing employer surveys for Western Europe, indicates three main motivations: performance of occasional jobs or peak activity; temporary replacements; prospecting among temporary workers for candidates to fill vacancies on a permanent basis. According to a survey conducted by Abraham (1988) in the US, among firms using temporary help employees 79% declared at least one motivation that might be put under the broad heading of variability in demand. Atkinson *et al.* (1996) report a survey for the UK, where firms indicated the following reasons to hire temporary workers (multiple answers allowed): matching peaks in demand (63.3%); covering holidays/sick leave (59.4%); performing one-off tasks (39%); trial for permanent work (20.2%); other. A recent survey for Italy (Confinterim, 2000) reports three reasons: peak activity (70%); replacements (18%); expertise not available within the firm (12%).

⁶The number of temporary workers needed by the firm during a positive non-permanent shock is exogenous and normalized to 1.

starts immediately after a positive shock is observed. At the beginning of such a period (call it time 0, with $D_0 = D_H$), the firm finds it profitable to hire a temporary worker, who can be easily laid off when demand returns to, or below, the normal level, unlike the primary labor force associated with infinite firing costs. The firm must choose whether to use the worker only at time 0 or to offer her/him a contract of length τ . Labor law sets the maximum allowed contract length at T . The firm is risk-neutral and discounts future payoffs at the rate β . There are a lot of initially identical risk-neutral temps, with reservation wage equal to w . The choice of the wage is determined by the worker's participation constraint. Assuming that workers can break the contract in every period, the wage schedule is given by: $w_t = w$.

Hiring a temp for the first time, the firm must bear a sunk cost s in specific training or transaction costs. The sunk cost s includes both the initial training cost necessary to teach to the worker how to accomplish her/his new tasks and the reduction of worker's productivity during the initial fitting-in period (i.e. the period needed to insert a new temp in the working environment). The sunk cost s might also incorporate a transaction cost component linked to the selection process. In every period, there is a probability λ that the firm will not be able to find the same worker used in a previous assignment. To make the problem relevant, it is assumed that: $\theta - w - \lambda s \geq 0$.

The choice of contract length depends both on the stochastic process D_t and the time horizon of the firm. Since contract length is usually constrained by labor law to be short, the span of the time periods that the problem can be decomposed in is small too. Market demand realizations are likely to be independent across periods or positively correlated between each other. In the following, two stochastic processes are considered.

1. D_t as a simple *i.i.d. process*. In every period, demand is high (D_H) with probability α ; normal (D_N) with probability $(1 - 2\alpha)$; or low (D_L) with probability α . The parameter α captures the volatility of market demand, i.e. the probability of experiencing a symmetric shock with respect to the normal level of activity.
2. D_t as a *discrete-time homogeneous Markov chain*. If demand is in state D_N , the next period there is the same probability α of observing a positive or a negative shock. If demand is in state D_H , in the next period it will either stay there with probability 2α or go back to D_N with probability $(1 - 2\alpha)$. Similarly, if demand is in state D_L , either it

will stay there with probability 2α or go to D_N with probability $(1 - 2\alpha)$. The parameter α captures the non-regularity of market demand, incorporating both volatility and the persistence of shocks.

As a matter of notation, the conditional probabilities of experiencing high, normal or low demand are defined as: $h_t = \Pr[D_{k+t} = D_H \mid D_k = D_H]$, $n_t = \Pr[D_{k+t} = D_N \mid D_k = D_H]$, $l_t = \Pr[D_{k+t} = D_L \mid D_k = D_H]$. In the i.i.d. process, they are time-independent and equal to the state probabilities. In the Markov process, they are given by: $h_t = \alpha^t + \alpha$, $n_t = 1 - 2\alpha$, $l_t = \alpha - \alpha^t$.

As pointed out by Dye (1985), “the best current contract depends on the contract concluded subsequent to the termination of the present one”. In the present setting, this element could be introduced in two different ways. From one point of view, we could think about the time horizon of the firm’s problem as being equal to T . If the firm decided to employ the worker for a period shorter than T and a new positive shock happened between the termination period and T , it would have to find a new employee using the “spot” market for temporary help employment. From another point of view, however, we might want to allow the firm to re-maximize when a new positive shock shows up, after the termination of the previous contract. This option could be embedded in an infinite-horizon problem. In the following, the problem will be analyzed both in finite and infinite horizon.

3.1 Finite Horizon

In the finite-horizon perspective, the firm chooses the length of the contract knowing that if it needs a temp after the termination period, it will have to use the THE spot market (i.e. the market for one-period temps). In such a case, the firm will have to again pay the sunk cost in selection or training, if it does not find the first-contract worker in the spot market. The discount rate β can be safely set to 1 in this case. Thus the firm’s choice of the optimal τ coincides with the following problem:

$$V = \max_{\tau \in [1, T]} \left\{ \theta - w - s + \sum_{t=1}^{\tau-1} (h_t \theta - w) + \sum_{t=\tau}^{T-1} h_t (\theta - w - \lambda s) \right\} \quad (\text{FH})$$

The longer contract condition (LCC) of the problem (the condition that makes it profitable for the firm to extend the contract from t to $t + 1$) is:

$$h_t \lambda s \geq (1 - h_t) w \quad (\text{LCC})$$

The left-hand side of the LCC represents the gain associated with a one-period increase of contract length (specifically, the expected saving in specific training or transaction costs). This expected saving comes from the option value of duration. The right-hand side represents the loss associated to a one-period increase of contract length (i.e. the expected wage loss if worker's productivity falls to zero). The necessary conditions for an interior τ to be optimal are that the LCC holds at $\tau - 1$ and it does not hold at τ ⁷.

With the i.i.d. process, since h_t does not depend on time ($h_t = \alpha$), the parameters of the model fully determine the relevant comparison. Only boundary solutions are possible. If we interpret as a positive effect on duration any shift from $\tau = 1$ to $\tau = T$, we can see that the optimal level of contract length is increasing in s , λ and α , and decreasing in w . These results are very intuitive: an increase of s (or λ) raises the marginal benefit of extending τ by one period; an increase of w raises the marginal cost; an increase of α both raises the marginal benefit and lowers the marginal cost.

With the Markov process, h_t is a decreasing function of time ($h_t = \alpha^t + \alpha$). The necessary conditions identify one or, at most, two candidate solutions, but now interior solutions are possible. The LCC is a decreasing and convex function of time. Looking at shifts in the LCC, we can easily see that the same comparative statics' implications hold. The optimal contract length is increasing in s , λ and α (i.e. their increase shifts the LCC upward), and decreasing in w (i.e. the opposite holds). The persistence of the positive shock reinforces the effect of demand volatility.

3.2 Infinite Horizon

In the infinite-horizon perspective, the optimization problem starts any time a positive shock occurs and the previous contract has already expired. Defining $p_{xy} = \Pr[D_{t+1} = D_Y \mid D_t = D_X]$, we can summarize the infinite horizon problem by means of the value functions in the states of high, normal and low demand, when the previous contract is no longer binding:

$$\begin{aligned} V_H &= V \\ V_N &= \beta(p_{nh}V_H + p_{nn}V_N + p_{nl}V_L) = \pi_N V \\ V_L &= \beta(p_{lh}V_H + p_{ln}V_N + p_{ll}V_L) = \pi_L V \end{aligned}$$

⁷For the boundary solutions, only one necessary condition is needed: that LCC does not hold at 1 for $\tau = 1$; that LCC_{T-1} holds at $T - 1$ for $\tau = T$.

This formulation highlights that no decision is actually associated with the states of normal and low demand, where temps are not productive. In a sense, V_H is an absorbing state, since the optimal choice of τ is made only when a positive shock occurs and the previous contract has already expired. Consequently, the infinite-horizon problem can be re-formulated as:

$$V = \max_{\tau \in [1, T]} \{P(\tau) + \pi(\tau)V\} \quad (\text{IH})$$

where:

$$\begin{aligned} P(\tau) &= (\theta - w - \lambda s) + \sum_{t=1}^{\tau-1} \beta^t (h_t \theta - w) \\ \pi(\tau) &= \beta^\tau (h_\tau + n_\tau \pi_N + l_\tau \pi_L) \end{aligned}$$

The choice of τ influences both the utility during the contract period $-P(\tau)$ - and the timing/discounting of the start of a new optimization decision $-\pi(\tau)$. Since the stochastic processes we are interested in are stationary, the problem assumes a fixed-point nature. Of course, the discount factor β matters in this setting. If $\beta = 1$, specific training or transaction costs are no longer an issue, since the firm must undertake it for an infinite number of times and the problem is not well defined ($\pi_N = \pi_L = 1$). If firms discount future payoffs ($\beta < 1$), the timing of the sunk-cost payment affects the decision problem.

The longer contract condition (LCC) of the infinite-horizon problem can be expressed as:

$$\frac{P(\tau + 1)}{1 - \pi(\tau + 1)} - \frac{P(\tau)}{1 - \pi(\tau)} \geq 0 \quad (\text{LCC})$$

By means of numerical simulations, it is possible to show that the same comparative statics results of the finite-horizon problem hold in this setting. In Appendix I -for the sake of concision- only the two main implications about volatility and fixed costs are graphically shown. For a first baseline configuration of the parameters,⁸ a smoothed increase of α enhances τ . Analogously, for a second baseline configuration of the parameters, a smoothed increase of s is associated with a step-by-step increase in τ .

⁸Many other configurations of the basic parameters have been used to perform similar simulations: they all lead to the same qualitative implications.

4 Econometric Analysis

4.1 Data

The previous model uses an option-value argument to find a positive effect of volatility (interpreted as the deviation of activity from its normal level) on contract duration. Longer contracts have an option value, since they can be used to sidestep (or to postpone) the sunk cost due to the selection or training of temps. In this respect, the proposed framework displays the same results of the most recent models reviewed in section 2, like Harris and Holmstrom's or Danziger's. A crucial feature of this argument is that the firm may not be able to re-hire a worker previously used in a short-term assignment ($\lambda \neq 0$). Since the probability of not finding the first-contract worker is greater in a tighter labor market, using a measure of local unemployment we can test the effect of λ together with the volatility effect (i.e. the effect of α). Both effects will be examined in this section.

Table 1. Characteristics of Italian temporary workers

Male	0.62
Age	28.7 years
Single	0.79
Blue	0.72
Italy	0.89
Second contract	0.34
Third contract	0.14
Waiting period	71 days
North	0.60
Center	0.25
South	0.15
Manufacturing	0.73
Services	0.26
Other sectors	0.01

The econometric analysis makes use of the national data set of “Manpower”, an international firm operating in the sector of THE and one of the main companies in the recently born Italian market. The market share of “Manpower” in Italy is around 25% and its agencies are distributed across all regions. The data set contains the individual characteristics of all temps

employed by “Manpower” agencies. The following personal details of each worker are reported: gender; age; place of residence; marital status; nationality; occupation profile (blue-collar or white-collar). The data set contains the number and time-length of temporary assignments, as well as the economic sector and geographical location of the client firms that used the worker.

The data set considers all the workers sent to temporary assignments. The starting dates of recorded assignments range from February 1998 to December 2001; the number of temporary workers is 111,161; the number of using firms is 23,027; the total number of signed contracts is 197,953. Table 1 reports some descriptive statistics of the individual characteristics of temporary workers employed by “Manpower”. All variables but age and “waiting period” (i.e. the waiting period from the enrollment in the agency list to the first assignment) are dummies. The representative temp is young (the average age is 28.7), single (79 percent); male (62 percent) and blue-collar (72 percent). The vast majority of workers is Italian, although 11 percent of them have different nationality. Nearly one third of workers (34 percent) received more than one temporary assignment, and 14 percent more than two. If we classify workers according to the broad sector of the economy or the geographical location where they were employed, we see that THE is prevalently used by firms in the North of the country (57 percent) and in the manufacturing sector (73 percent). The figures for firms instead of workers (not reported in Table 1) are slightly different: 71 percent in the manufacturing sector and 69 percent from the North. This means that manufacturing firms are not only the lion’s share of those using temps, but they also use this new form of employment more frequently than other firms. Firms from the South use THE intensively (15 percent of total workers), even though they are a smaller fraction of the total using firms (4 percent).

Some additional stylized facts should be taken into account. According to an employer survey (Confinterim, 2000), 70% of using firms report “peak activity” as the main rationale for hiring temps in Italy. As noted above, the estimated utilization intensity of temporary employees by economic sector is positively correlated with production volatility (Nannicini, 2004). Moreover, the bargaining power of temporary workers appears to be considerably lower than that of regular and unionized workers. On the whole, the basic assumptions of the model developed in Section 3 seem to reasonably describe the case of THE in Italy.

4.2 Testing Model's Predictions

In order to test the volatility effect, we must choose how to measure variability in economic activity. Considering the available data, the variance of the sectorial index of industrial production (VOL) can be used in this respect. This measure can be retrieved for 9 manufacturing sectors from official statistics by “Istat” (“Conti trimestrali”). The fact that only manufacturing sectors are considered is not a great limitation, since -as shown in table 1- the vast majority of Italian temps are employed in manufacturing. The values of VOL for the period of the “Manpower” data set average 455 in the available sectors,⁹ with a standard deviation equal to 116. It is also interesting to look at the effect of positive variability only, using the part of the variance for the periods when the index of industrial production is above its trend level (POS). The values of POS average 201 in the available sectors, with a standard deviation equal to 35. Moreover, in order to exploit not only the between-industry variation but also the within-industry variation, we could use the variance of the sectorial index of industrial production in the 12 months before the signing of each contract (VOL12).¹⁰ As soon as data with a longer time spell become available, it will be interesting to look at the effect of some measure of the persistence of positive shocks.

In order to test the labor-market effect (i.e. the effect of the probability of not finding a worker previously used in a short-term assignment), we must obtain a measure of the tightness of the labor market by geographical location. The unemployment rate by province (U) can be used in this respect.¹¹ This local unemployment rate can be retrieved for the 103 Italian provinces from “Istat” statistics (see “Indagine sulla forza lavoro”). For the period of the “Manpower” data set, the values of U (in percentage terms) average 7.7, with a standard deviation equal to 5.5.

⁹The sectors are: “food&etc.”; “textiles&etc.”; “wood&etc.”; “chemicals”; “non-metal minerals”; “metals”; “energy”; “machinery&electronics”; “transportation manufacturing”.

¹⁰As an alternative to this measure, we could use the variance of the index of industrial production in the 12 months *after* the signing of each contract (incorporating a rational-expectation assumption). But we would lose 12 months of observations lowering the explicative power of the within-industry variation.

¹¹Notice that the econometric results presented in this section are not altered by the utilization of the young unemployment rate (considering that temps are mostly young workers) instead of the overall unemployment rate. The same holds if one uses a proxy of λ derived directly from the “Manpower” data set, such as the province-specific average waiting time in the agency list.

The dependent variable of the analysis is the duration of a single contract. In the restricted 9-sector data set (containing information on 116,979 individual contracts), the average duration is equal to 57.7 days (with a standard deviation equal to 79), while the median duration is 30 days. The distribution of observed contract length is positively skewed. A semilog specification seems appropriate. Hence, the dependent variable used in the following is the log of contract duration (DUR).

Concerning the econometric specification, duration techniques are not appropriate, as one could think at first. The dependent variable is the duration agreed upon at the signing of the contract, depending on the worker's and firm's characteristics at that point. Premature separations are not observed. Using standard regression techniques, however, we must be aware of the problem caused by the merging of micro and aggregate data (Kloek, 1981; Moulton, 1990). The specification must incorporate the fact that disturbances are correlated within groups. It is reasonable to expect that units within the same industry share some unobservable characteristics that lead the regression disturbances to be correlated. Failure to incorporate group effects may produce a large downward bias in the standard errors, especially if the effect of interest has to be estimated using between-group variation.

Two settings can be considered: (1) longitudinal data set with the date of the contract as the time dimension, where VOL12 is the volatility measure; (2) pooled cross-section with only the first contract of each individual, where VOL and POS are two alternative volatility measures. In the first setting, it is possible to control for industry-specific fixed effects and to exploit the *within variability* while estimating the volatility effect. In the second setting, it is possible to exploit the *between variability* while estimating the volatility effect, but it is necessary to control for within-industry disturbance correlation. There are two general ways to deal with such a bias in the pooled cross-section setting: (a) to fix up the naive OLS standard errors; (b) to estimate a random-effect specification. In the following, all these solutions are implemented to control for potential within-industry correlation.

Table 2 reports the results of the regression of the log of contract length (DUR) on volatility (VOL12 or VOL), unemployment (U) and the available controls. The first specification refers to the longitudinal setting and controls both for industry-specific fixed-effect and individual random-effect (adjusting the standard errors for clustering). The other specifications refer to the pooled cross-section setting. The second one is standard OLS. The third one is OLS with fixed-up standard errors, to incorporate the within-industry

correlation of disturbances as suggested by Moulton (1986).¹² The fourth one is a maximum-likelihood (ML) random-effect regression.

According to the fixed-effect specification, an increase of the within volatility equal to its standard deviation produces on average an 8% increase of contract length. According to pooled OLS, an increase of the between volatility equal to its standard deviation produces on average a 15% increase of contract length. The ML random-effect slightly increases the volatility effect to 17%. However, while in the fixed-effect specification volatility is significant at the level of 1%, in the OLS with Moulton-adjusted standard errors and in the ML random-effect specification volatility is significant only at the 10% level. The labor market effect shows the expected sign and is significant at the 1% level in all the considered specifications. An increase of the unemployment rate equal to its standard deviation has a negative effect from 13% to 15% on contract length.

Table 3 reports the results of the regression of the log of contract length (DUR) on positive volatility (POS12 or POS), unemployment (U) and the available controls. In the pooled cross-section setting, OLS with and without Moulton-adjusted standard errors and the ML random-effect specification are reported. According to OLS, an increase of the positive variance equal to its standard deviation produces on average a 21% increase of contract length. An increase of the unemployment rate equal to its standard deviation produces a 14% drop. In the ML random-effect, both the volatility and the labor market effects have a slightly greater magnitude (24% and 15% respectively). Most importantly, both the labor market effect and the positive volatility effect are always significant at the level of 1% in all the considered specifications. Notice that the econometric results presented in Table 2 and Table 3 are not altered by the introduction of a full set of interactions.

¹²The Moulton factor used to correct OLS standard errors is given by:

$$\frac{V(\hat{\beta})}{V_0(\hat{\beta})} = 1 + \left[\frac{V(n_s)}{\bar{n}} + (\bar{n} - 1) \right] \rho_X \rho$$

where $\hat{\beta}$ is the OLS slope coefficient estimator of the regressor X ; $\frac{V(\hat{\beta})}{V_0(\hat{\beta})}$ the ratio of the true variance of the estimator to its misspecified variance; n_s the size of group s ; \bar{n} the average group size; ρ_X the intraclass correlation of the regressor X ; ρ the intraclass correlation of disturbances (under the assumption that errors are equicorrelated within groups).

Table 2. The effects of volatility and unemployment

	(1)	(2)	(3)	(4)
	DUR	DUR	DUR	DUR
VOL12	.0231 (.0075)	- -	- -	- -
VOL	- -	.0013 (.0001)	.0013 (.0007)	.0015 (0.0008)
U	-.0281 (.0021)	-.0251 (.0012)	-.0251 (.0115)	-.0280 (.0011)
Male	.0059 (.0165)	.0366 (.0102)	.0366 (.0882)	.0055 (.0106)
Age	.0076 (.0011)	.0083 (.0007)	.0083 (.0022)	.0076 (.0007)
Single	-.1610 (.0193)	-.1759 (.0132)	-.1759 (.0197)	-.1612 (.0122)
Italy	-.1405 (.0164)	-.1566 (.0117)	-.1566 (.0484)	-.1404 (.0141)
Blue	-.4117 (.0231)	-.3166 (.0162)	-.3166 (.1066)	-.4111 (.0135)
North	-.2142 (.0129)	-.1761 (.0097)	-.1761 (.0419)	-.2142 (.0106)
South	-.5112 (.0365)	-.4480 (.0151)	-.4480 (.2562)	-.5109 (.0152)

(1) Fixed-effect; (2) POLS; (3) POLS Moulton s.e.; (4) random-effect.

To sum up, the empirical evidence presented here is consistent with the two main implications derived from the simple theoretical model presented in Section 3. Contract length is longer in more volatile sectors, since the duration of THE assignments may have an option value. Contract length is lower where unemployment is greater, since it is also greater the probability of finding again a worker previously used in a short-term assignment. The first empirical finding is also coherent with the implications of the most recent models on contract length reviewed in Section 2, such as Harris and Holmstrom's (1987) and Danziger's (1988).

Table 3. The effects of positive volatility and unemployment

	(1)	(2)	(3)	(4)
	DUR	DUR	DUR	DUR
POS12	.0115 (.0010)	- -	- -	- -
POS	- -	.0060 (.0001)	.0060 (0.0020)	.0069 (.0021)
U	-.0283 (.0021)	-.0266 (.0011)	-.0266 (.0108)	-.0280 (.0011)
Male	.0074 (.0165)	.0181 (.0101)	.0181 (.0907)	.0056 (.0106)
Age	.0076 (.0011)	.0082 (.0006)	.0082 (.0021)	.0076 (.0007)
Single	-.1588 (.0193)	-.1672 (.0117)	-.1672 (0.0127)	-.1612 (.0122)
Italy	-.1368 (.0164)	-.1365 (.0132)	-.1365 (.0381)	-.1404 (.0141)
Blue	-.4132 (.0181)	-.3534 (.0132)	-.3534 (.1132)	-.4111 (.0135)
North	-.2155 (.0128)	-.1767 (.0096)	-.1767 (.0369)	-.2140 (.0106)
South	-.5166 (.0346)	-.4768 (.0151)	-.4768 (0.2468)	-.5109 (.0152)

(1) Fixed-effect; (2)POLS; (3) POLS Moulton s.e.; (4) random-effect.

5 Conclusion

In this paper, I have investigated the effect of production volatility on the duration of THE contracts. In order to highlight the relevant trade-off in the firm's choice of assignment durations, I have developed a very simple theoretical model in Section 3. The model has two testable implications. First, volatility positively influences contract length, because of an option-value argument: assuming that the hiring of a new temp is associated with selection and training costs, longer contracts have an option value in the face of greater uncertainty. Second, the shortage of alternative employment

opportunities negatively influences contract length, since the option value of duration is reduced by the greater probability of finding a temp previously selected and trained. Using data on the temporary workers hired by one of the leading agencies in Italy, both implications are confirmed by the econometric analysis in Section 4, even after carefully controlling for within-industry disturbance correlation. The industry-specific variance of production is positively correlated with contract length. On the contrary, the province-specific unemployment rate is negatively correlated with contract length.

On the whole, in the Italian THE market, more volatile sectors both use THE more intensively (Nannicini, 2004) and offer longer contracts. Since contract duration turns out to be a good proxy of the precariousness of temps (as discussed in Section 1), these workers are better off in more volatile sectors. A similar result might seem surprising at a first glance. But it is not, if one agrees with the option-value argument developed in this paper. Sectors that mostly need employment flexibility are using THE more intensively, but it is precisely in these sectors that temporary workers -in a sense- are not so “temporary”. Employers who know that they will need temps frequently in the near future are concerned about minimizing selection and training costs, and they are more willing to invest in temps to keep them linked to their working environment.

References

- [1] ABRAHAM K.G. (1988), *Flexible Staffing Arrangements and Employers' Short-term Adjustment Strategies*, in HART R.A. (ed), *Employment, Unemployment and Labor Utilization*, Unwin Hyman
- [2] ATKINSON J., RICK J., MORRIS S. and WILLIAMS M. (1996), *Temporary work and the labour market*, Report 311, The Institute for Employment Studies, Brighton
- [3] AUTOR D.H. (2000a), *Why Do Temporary Help Firms Provide Free General Skills Training?*, NBER Working Paper n.7637
- [4] AUTOR D.H. (2000b), *Outsourcing at Will: Unjust Dismissal Doctrine and the Growth of Temporary Help Employment*, NBER Working Paper n.7557
- [5] BRONSTEIN A.S. (1991), *Temporary Work in Western Europe: Threat or Complement to Permanent Employment?*, in "International Labour Review", 3, 291-310
- [6] CONFINTERIM (2000), *Il lavoro temporaneo*, Milano
- [7] DANZIGER L. (1988), *Real Shocks, Efficient Risk Sharing, and the Duration of Labor Contracts*, in "The Quarterly Journal of Economics", 103, 435-440
- [8] DYE R.A. (1985), *Optimal Length of Labor Contracts*, in "International Economic Review", 26, 1, 251-270
- [9] ESTEVAO M. and LACH S. (1999), *The Evolution of the Demand for Temporary Help Supply Employment in the United States*, NBER Workin Paper n.7427
- [10] GRAY J.A. (1978), *On Indexation and Contract Length*, in "Journal of Political Economy", 86, 1-18
- [11] HARRIS M. and HOLMSTROM B. (1987), *On the Duration of Agreements*, in "International Economic Review", 28, 2, 389-406

- [12] HOUSEMAN S.N. (2000), *Why Employers Use Flexible Staffing Arrangements: Evidence from an Establishment Survey*, Upjohn Institute Working Paper N.01-67
- [13] ICHINO A., MEALLI F. and NANNICINI T. (2004), *Temporary Work Agencies in Italy: A Springboard to Permanent Employment?*, Paper presented at the Annual Meeting of the Canadian Economics Association
- [14] KLOEK T. (1981), *OLS Estimation in a Model where a Microvariable is Explained by Aggregates and Contemporaneous Disturbances are Equicorrelated*, in "Econometrica", 49, 1, 205-207
- [15] LECHNER M., ALMUS M., PFEIFFER F. and SPENGLER H. (2001), *The Impact of Non-profit Temping Agencies on Individual Labour Market Success in the West German State of Rhineland-Palatinate*, in LECHNER M. and PFEIFFER F. (eds), *Econometric Evaluation of Labour Market Policies*, Heidelberg: Physica/Springer, 211-242
- [16] MALO M.A. and MUNOZ-BULLON F. (2002), *Temporary Help Agencies and the Labour Market Biography: A Sequence-Oriented Approach*, FEDEA, EEE 132
- [17] MONTANINO A. and SESTITO P. (2003), *Le molte funzioni del lavoro interinale in Italia: da strumento di flessibilità a contratto di prova*, in "Rivista di Politica Economica", marzo-aprile 2003
- [18] MOULTON B.R. (1986), *Random Group Effects and the Precision of Regression Estimates*, in "Journal of Econometrics", 32, 385-397
- [19] MOULTON B.R. (1990), *An Illustration of a Pitfall in Estimating the Effects of Aggregate Variables on Micro Units*, in "The Review of Economics and Statistics", 334-338
- [20] MURPHY K. (1992), *Determinants of Contract Duration in Collective Bargaining Agreements*, in "Industrial and Labor Relations Review", 45, 352-365
- [21] NANNICINI T. (2004), *The Take-Off of Temporary Help Employment in the Italian Labor Market*, ECO-EUI Working Paper n.9/04

- [22] OECD (2002), *Taking the measure of temporary employment*, in *Employment Outlook*, Paris
- [23] PIORE M. (1980), *Dualism as a Response to Flux and Uncertainty*, in BERGER S. and PIORE M. (eds), *Dualism and Discontinuity in Industrial Society*, Cambridge University Press
- [24] RUSSO G., GORTER C. and MOOLENAAR D. (1997), *Lavori temporanei e lavoratori temporanei: l'esperienza olandese*, in "Lavoro e relazioni industriali", 2, 61-94
- [25] SAINT-PAUL G. (1996), *Dual Labor Markets*, MIT Press
- [26] SEGAL L.M. and SULLIVAN D.G. (1997a), *Temporary Services Employment Durations: Evidence from State UI Data*, WP-97-23, Federal Reserve Bank of Chicago
- [27] SEGAL L.M. and SULLIVAN D.G. (1997b), *The Growth of Temporary Services Work*, in "Journal of Economic Perspectives", 11, 2, 117-136
- [28] VROMAN S. (1989), *Inflation Uncertainty and Contract Duration*, in "Review of Economics and Statistics", 71, 677-681
- [29] WALLACE F. and BLANCO H. (1991), *The Effects of Real and Nominal Shocks on Union-Firm Contract Duration*, in "Journal of Monetary Economics", 27, 361-380

Appendix I

